User Guide

Twisted Pair

MTP 1500RL 15HD A SEQ

Extended Distance Twisted Pair Receiver

Extron® Electronics

INTERFACING, SWITCHING AND CONTROL

68-1554-01 Rev. B
01 12

Precautions

Safety Instructions • English

This symbol is intended to alert the user of important operating and maintenance (servicing) instructions in the literature provided with the equipment.

This symbol is intended to alert the user of the presence of uninsulated dangerous voltage within the product's enclosure that may present a risk of electric shock.

Caution

Read Instructions • Read and understand all safety and operating instructions before using the equipment.

Retain Instructions • The safety instructions should be kept for future reference.

Follow Warnings • Follow all warnings and instructions marked on the equipment or in the user information.

Avoid Attachments • Do not use tools or attachments that are not recommended by the equipment manufacturer because they may be hazardous.

Consignes de Sécurité • Français

Ce symbole sert à avertir l'utilisateur que la documentation fournie avec le matériel contient des instructions importantes concernant l'exploitation et la maintenance (réparation).

Ce symbole sert à avertir l'utilisateur de la présence dans le boîtier de l'appareil de tensions dangereuses non isolées posant des risques d'électrocution.

Attention

Lire les instructions• Prendre connaissance de toutes les consignes de sécurité et d'exploitation avant d'utiliser le matériel.

Conserver les instructions• Ranger les consignes de sécurité afin de pouvoir les consulter à l'avenir.

Respecter les avertissements • Observer tous les avertissements et consignes marqués sur le matériel ou présentés dans la documentation utilisateur.

Eviter les pièces de fixation • Ne pas utiliser de pièces de fixation ni d'outils non recommandés par le fabricant du matériel car cela risquerait de poser certains dangers.

Sicherheitsanleitungen • Deutsch

Dieses Symbol soll dem Benutzer in der im Lieferumfang enthaltenen Dokumentation besonders wichtige Hinweise zur Bedienung und Wartung (Instandhaltung) geben.

Dieses Symbol soll den Benutzer darauf aufmerksam machen, daß im Inneren des Gehäuses dieses Produktes gefährliche Spannungen, die nicht isoliert sind und die einen elektrischen Schock verursachen können, herrschen.

Achtung

Lesen der Anleitungen • Bevor Sie das Gerät zum ersten Mal verwenden, sollten Sie alle Sicherheits-und Bedienungsanleitungen genau durchlesen und verstehen.

Aufbewahren der Anleitungen • Die Hinweise zur elektrischen Sicherheit des Produktes sollten Sie aufbewahren, damit Sie im Bedarfsfall darauf zurückgreifen können.

Befolgen der Warnhinweise • Befolgen Sie alle Warnhinweise und Anleitungen auf dem Gerät oder in der Benutzerdokumentation.

Keine Zusatzgeräte • Verwenden Sie keine Werkzeuge oder Zusatzgeräte, die nicht ausdrücklich vom Hersteller empfohlen wurden, da diese eine Gefahrenquelle darstellen können.

Instrucciones de seguridad • Español

Este símbolo se utiliza para advertir al usuario sobre instrucciones importantes de operación y mantenimiento (o cambio de partes) que se desean destacar en el contenido de la documentación suministrada con los equipos.

Este símbolo se utiliza para advertir al usuario sobre la presencia de elementos con voltaje peligroso sin protección aislante, que puedan encontrarse dentro de la caja o alojamiento del producto, y que puedan representar riesgo de electrocución.

Precaucion

Leer las instrucciones • Leer y analizar todas las instrucciones de operación y seguridad, antes de usar el equipo.

Conservar las instrucciones • Conservar las instrucciones de seguridad para futura consulta.

Obedecer las advertencias • Todas las advertencias e instrucciones marcadas en el equipo o en la documentación del usuario, deben ser obedecidas.

Evitar el uso de accesorios • No usar herramientas o accesorios que no sean especificamente recomendados por el fabricante, ya que podrian implicar riesgos.

安全须知 • 中文

这个符号提示用户该设备用户手册中有重要的操作和维护说明。

这个符号警告用户该设备机壳内有暴露的危险电压，有触电危险。

注意

阅读说明书 • 用户使用该设备前必须阅读并理解所有安全和使用说明。

保存说明书 • 用户应保存安全说明书以备将来使用。

遵守警告 • 用户应遵守产品和用户指南上的所有安全和操作说明。

避免追加 • 不要使用该产品厂商没有推荐的工具或追加设备，以避免危险。

Warning

Power sources • This equipment should be operated only from the power source indicated on the product. This equipment is intended to be used with a main power system with a grounded (neutral) conductor. The third (grounding) pin is a safety feature, do not attempt to bypass or disable it.

Power disconnection • To remove power from the equipment safely, remove all power cords from the rear of the equipment, or the desktop power module (if detachable), or from the power source receptacle (wall plug).

Power cord protection • Power cords should be routed so that they are not likely to be stepped on or pinched by items placed upon or against them.

Servicing • Refer all servicing to qualified service personnel. There are no user-serviceable parts inside. To prevent the risk of shock, do not attempt to service this equipment yourself because opening or removing covers may expose you to dangerous voltage or other hazards.

Slots and openings • If the equipment has slots or holes in the enclosure, these are provided to prevent overheating of sensitive components inside. These openings must never be blocked by other objects.

Lithium battery • There is a danger of explosion if battery is incorrectly replaced. Replace it only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Avertissement

Alimentations• Ne faire fonctionner ce matériel qu'avec la source d'alimentation indiquée sur l'appareil. Ce matériel doit être utilisé avec une alimentation principale comportant un fil de terre (neutre). Le troisième contact (de mise à la terre) constitue un dispositif de sécurité : n'essayez pas de la contourner ni de la désactiver.

Déconnexion de l'alimentation• Pour mettre le matériel hors tension sans danger, déconnectez tous les cordons d'alimentation de l'arrière de l'appareil ou du module d'alimentation de bureau (s'il est amovible) ou encore de la prise secteur.

Protection du cordon d'alimentation • Acheminer les cordons d'alimentation de manière à ce que personne ne risque de marcher dessus et à ce qu'ils ne soient pas écrasés ou pincés par des objets.

Réparation-maintenance • Faire exécuter toutes les interventions de réparation-maintenance par un technicien qualifié. Aucun des éléments internes ne peut être réparé par l'utilisateur. Afin d'éviter tout danger d'électrocution, l'utilisateur ne doit pas essayer de procéder lui-même à ces opérations car l'ouverture ou le retrait des couvercles risquent de l'exposer à de hautes tensions et autres dangers.

Fentes et orifices • Si le boîtier de l'appareil comporte des fentes ou des orifices, ceux-ci servent à empêcher les composants internes sensibles de surchauffer. Ces ouvertures ne doivent jamais être bloquées par des objets.

Lithium Batterie • Il a danger d'explosion s'll y a remplacment incorrect de la batterie. Remplacer uniquement avec une batterie du meme type ou d'un ype equivalent recommande par le constructeur. Mettre au reut les batteries usagees conformement aux instructions du fabricant.

Vorsicht

Stromquellen • Dieses Gerät sollte nur über die auf dem Produkt angegebene Stromquelle betrieben werden. Dieses Gerät wurde für eine Verwendung mit einer Hauptstromleitung mit einem geerdeten (neutralen) Leiter konzipiert. Der dritte Kontakt ist für einen Erdanschluß, und stellt eine Sicherheitsfunktion dar. Diese sollte nicht umgangen oder außer Betrieb gesetzt werden.

Stromunterbrechung • Um das Gerät auf sichere Weise vom Netz zu trennen, sollten Sie alle Netzkabel aus der Rückseite des Gerätes, aus der externen Stomversorgung (falls dies möglich ist) oder aus der Wandsteckdose ziehen.

Schutz des Netzkabels • Netzkabel sollten stets so verlegt werden, daß sie nicht im Weg liegen und niemand darauf treten kann oder Objekte darauf- oder unmittelbar dagegengestellt werden können.

Wartung • Alle Wartungsmaßnahmen sollten nur von qualifiziertem Servicepersonal durchgeführt werden. Die internen Komponenten des Gerätes sind wartungsfrei. Zur Vermeidung eines elektrischen Schocks versuchen Sie in keinem Fall, dieses Gerät selbst öffnen, da beim Entfernen der Abdeckungen die Gefahr eines elektrischen Schlags und/oder andere Gefahren bestehen.

Schlitze und Öffnungen • Wenn das Gerät Schlitze oder Löcher im Gehäuse aufweist, dienen diese zur Vermeidung einer Überhitzung der empfindlichen Teile im Inneren. Diese Öffnungen dürfen niemals von anderen Objekten blockiert werden.

Litium-Batterie • Explosionsgefahr, falls die Batterie nicht richtig ersetzt wird. Ersetzen Sie verbrauchte Batterien nur durch den gleichen oder einen vergleichbaren Batterietyp, der auch vom Hersteller empfohlen wird. Entsorgen Sie verbrauchte Batterien bitte gemäß den Herstelleranweisungen.

Advertencia

Alimentación eléctrica • Este equipo debe conectarse únicamente a la fuente/tipo de alimentación eléctrica indicada en el mismo. La alimentación eléctrica de este equipo debe provenir de un sistema de distribución general con conductor neutro a tierra. La tercera pata (puesta a tierra) es una medida de seguridad, no puentearia ni eliminaria.

Desconexión de alimentación eléctrica • Para desconectar con seguridad la acometida de alimentación eléctrica al equipo, desenchufar todos los cables de alimentación en el panel trasero del equipo, o desenchufar el módulo de alimentación (si fuera independiente), o desenchufar el cable del receptáculo de la pared.

Protección del cables de alimentación • Los cables de alimentación eléctrica se deben instalar en lugares donde no sean pisados ni apretados por objetos que se puedan apoyar sobre ellos.

Reparaciones/mantenimiento • Solicitar siempre los servicios técnicos de personal calificado. En el interior no hay partes a las que el usuario deba acceder. Para evitar riesgo de electrocución, no intentar personalmente la reparación/mantenimiento de este equipo, ya que al abrir o extraer las tapas puede quedar expuesto a voltajes peligrosos u otros riesgos.

Ranuras y aberturas • Si el equipo posee ranuras o orificios en su caja/alojamiento, es para evitar el sobrecalientamiento de componentes internos sensibles. Estas aberturas nunca se deben obstruir con otros objetos.

Batería de litio • Existe riesgo de explosión si esta batería se coloca en la posición incorrecta. Cambiar esta batería únicamente con el mismo tipo (o su equivalente) recomendado por el fabricante. Desachar las baterías usadas siguiendo las instrucciones del fabricante.

警告

电源 • 该设备只能使用产品上标明的电源。 设备必须使用有地线的供电系统供电。 第三条线（地线）是安全设施，不能不用或跳过 。

拔掉电源 • 为安全地从设备拔掉电源，请拔掉所有设备后或桌面电源的电源线，或任何接到市电系统的电源线。

电源线保护 • 妥善布线， 避免被踩踏，或重物挤压。

维护 • 所有维修必须由认证的维修人员进行。 设备内部没有用户可以更换的零件。为避免出现触电危险不要自己试图打开设备盖子维修该设备。

通风孔 • 有些设备机壳上有通风槽或孔，它们是用来防止机内敏感元件过热。 不要用任何东西挡住通风孔。

锂电池 • 不正确的更换电池会有爆炸的危险。必须使用与厂家推荐的相同或相近型号的电池。按照生产厂的建议处理废弃电池。

FCC Class A Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

The Class A limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

NOTE: This unit was tested with shielded cables on the peripheral devices. Shielded cables must be used with the unit to ensure compliance with FCC emissions limits.

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Conventions Used in this Guide

In this user guide, the following are used:

CAUTION: A caution indicates a potential hazard to equipment or data.

NOTE: A note draws attention to important information.

TIP: A tip provides a suggestion to make working with the application easier.

WARNING: A warning warns of things or actions that might cause injury, death, or other severe consequences.

Commands are written in the fonts shown here:

```
^AR Merge Scene,,Op1 scene 1,1 ^B 51 ^W^C
```

```
[Ø1] R ØØØ4 ØØ3ØØ ØØ4ØØ ØØ8ØØ ØØ6ØØ [Ø2] 35 [17] [Ø3]
```

Esc X1 * X17 * X20 * X23 * X21 CE ←

NOTE: For commands and examples of computer or device responses mentioned in this guide, the character "Ø" is used for the number zero and "O" represents the capital letter "o."

Computer responses and directory paths that do not have variables are written in the font shown here:

```
Reply from 2Ø8.132.18Ø.48: bytes=32 times=2ms TTL=32
```

```
C:\Program Files\Extron
```

Variables are written in slanted form as shown here:

```
ping xxx.xxx.xxx.xxx –t
```

```
SOH R Data STX Command ETB ETX
```

Selectable items, such as menu names, menu options, buttons, tabs, and field names are written in the font shown here:

From the **File** menu, select **New**.

Click the **OK** button.

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Introduction

This manual details the installation and operation of the Extron MTP 1500RL 15HD A SEQ Twisted Pair receiver with audio and skew equalization

In this guide the following terms are used:

- "Transmitter" refers specifically to the MTP transmitter.
- "Receiver" or "SEQ receiver" refers specifically to the MTP 1500RL 15HD A SEQ receiver with skew equalization.

MTP 1500RL 15HD A SEQ Description

The receiver is used for long distance distribution of RGB, component (bi-/tri-level), S-video, or composite video and audio over twisted pair cables.

It is a half rack size twisted pair receiver that is fully compatible with all MTP transmitters, distribution amplifiers, matrix switchers and associated video accessories. When used with any of the Extron MTP transmitter models, the receiver can transmit video over extended or standard distances.

The MTP 1500RL 15HD A SEQ receive signals up to 2048x1080, HD component video (up to1080p), standard component, S-video, bi-level or tri-level component video, and high resolution RGB video). This is done using an RJ-45 connection and over an Extron Enhanced Skew-Free™ AV UTP cable, or over a Category (CAT) 5, 5e or CAT 6, shielded twisted pair (STP), unshielded twisted pair (UTP), or foil shielded twisted pair (FTP) cable.

The receiver outputs multiple RGB formats, composite video, S-video and component video on the 15-pin HD connector, according to the current DIP switch settings.

NOTE: The MTP 1500RL receiver cannot be used with VTT or TP transmitters.

The receiver ships with external desktop 12 V, 1 A power supply that accepts 100 to 240 VAC, 50 Hz to 60 Hz input.

Features

- Receives high resolution video and mono audio signals 1,500 feet (450 meters) or more over a single CAT 5-type cable
- Supports RGBHV, RGBS, RGsB, RsGsBs, component, S-video, and composite video
- Compatible with HDTV component video, bi-level or tri-level sync
- Separate continuously variable level and peaking controls
- Buffered MTP loop-through for daisy-chaining up to eight receivers
- Independent skew compensation adjustments for each color
- Compatible with any Extron MTP transmitter
- Low profile, rack-mountable metal enclosure

Transmission Distance

The maximum transmission distance is determined by the frequency and resolution of the transmitted signal. The table below shows the maximum transmission distances (in feet and meters) and the transmitter Pre-peak switch positions using Extron Enhanced Skew-Free AV UTP cable or UTP CAT cable, terminated with RJ-45 connectors.

Transmission Distances in feet (meteres)			
Video Format	**Pre-peak Off**	**Pre-peak On**	**Max Distance**
Vid, S-vid, YUV	<1300 (396)	>1400 (427)	1500 (457)
640x480	<1300 (396)	>1400 (427)	1500 (457)
800x600	<1300 (396)	>1400 (427)	1500 (457)
1024x768	<1300 (396)	>1400 (427)	1500 (457)
1280x960	<1300 (396)	>1400 (427)	1500 (457)
1280x1024	<1300 (396)	>1400 (427)	1500 (457)
1360x765	<1300 (396)	>1400 (427)	1500 (457)
1365x768	<1300 (396)	>1400 (427)	1500 (457)
1366x768	<1300 (396)	>1400 (427)	1500 (457)
1440x960	<1300 (396)	>1400 (427)	1500 (457)
1440x1050	<1300 (396)	>1400 (427)	1500 (457)
1600x1200	<1300 (396)	>1400 (427)	1500 (457)
1920x1200	<1000 (305)	>1100 (335)	1200 (366)
2048x1080	<1000 (305)	>1100 (335)	1200 (366)
720p	<1300 (396)	>1400 (427)	1500 (457)
1080i	<1300 (396)	>1400 (427)	1500 (457)
1080p	<1300 (396)	>1400 (427)	1500 (457)

NOTE: The maximum distance is defined as the distance from the first input signal source to the last output signal display, regardless of the number and type of devices between.

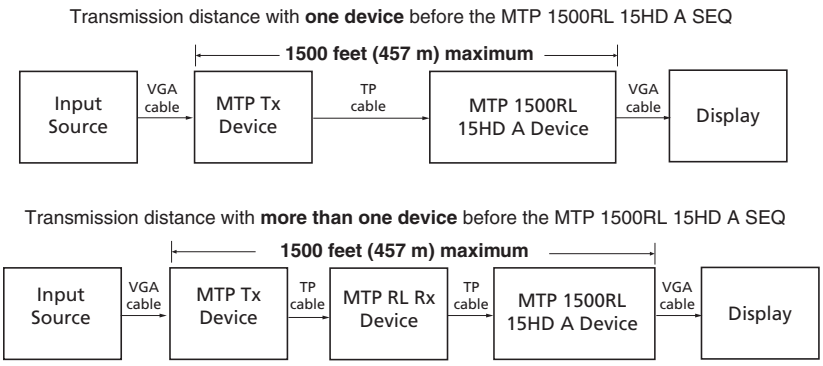


Figure 1. Maximum Transmission Distances

NOTE: The transmitter and receiver are designed for and perform best with Extron Enhanced Skew-Free AV cable terminated in accordance with the TIA/EIA T568A standard. CAT 5 cables are acceptable but less preferable. Using pre-terminated and tested cables is also recommended. Cables terminated on-site should be tested before use to ensure that they comply with Category 5 specifications.

MTP 1500RL 15HD A SEQ Application Diagram

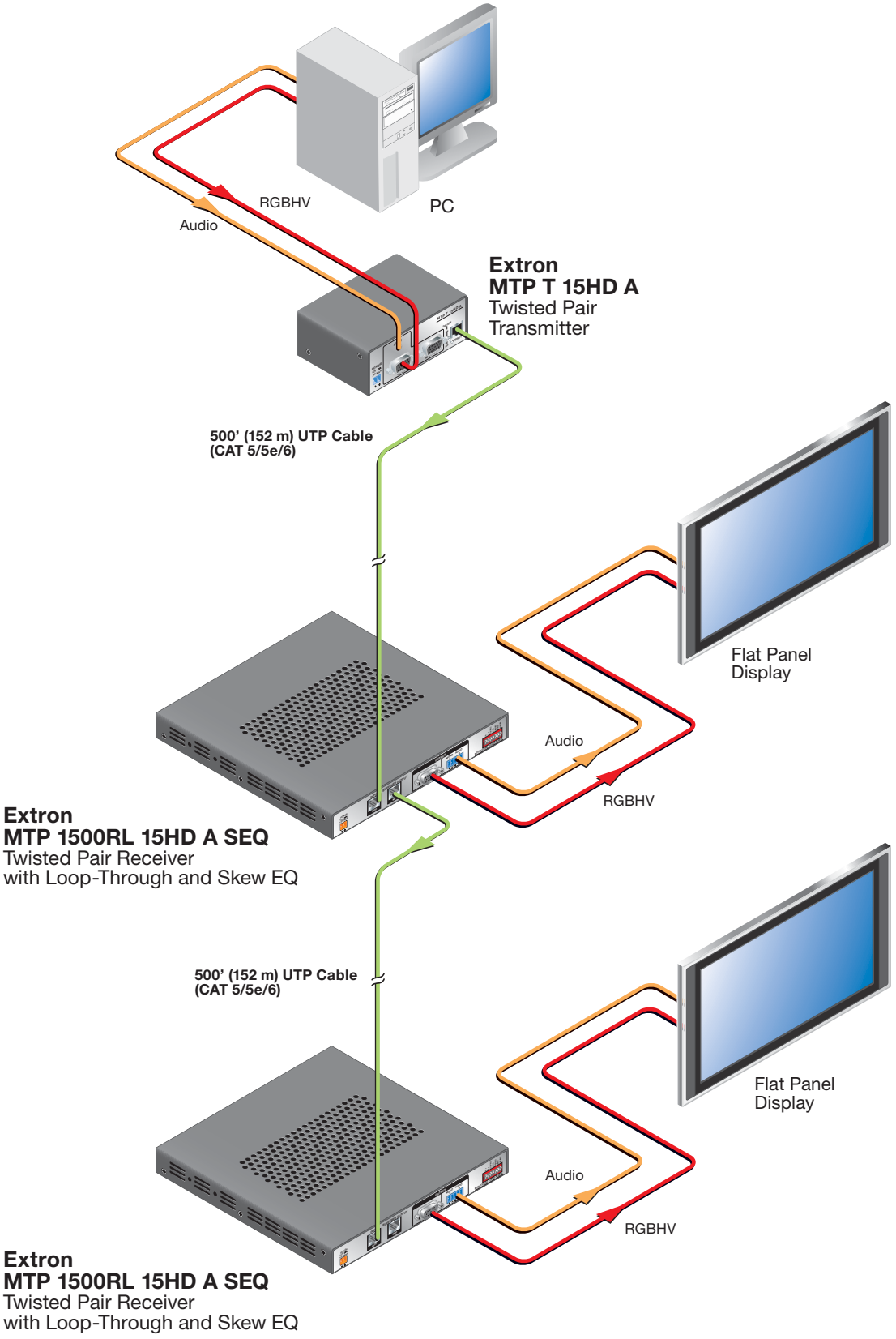


Figure 2. Typical MTP 1500RL 15HD A SEQ Application

Installation and Setup

This section describes how to connect applicable cables to the MTP 1500RL A SEQ receiver.

It covers:

- **Rear Panel Features**
- **Power Supply Wiring**
- **TP Cable Termination**

Rear Panel Features

Rear panel connectors and features for the MTP 1500RL A SEQ receiver is shown below.

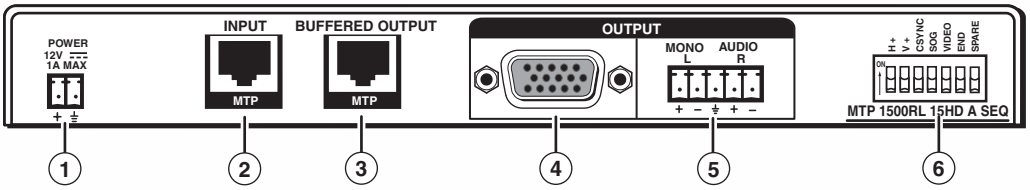


Figure 3. Rear Panel Features of the MTP 1500RL 15HD A SEQ

① **Power connector** — Plug the included external 12 VDC, 1 A, power supply into this 2-pole captive screw connector (see "**Power Supply Wiring"** section for wiring details).

CAUTIONS:
- Always use a power supply supplied or specified by Extron. Use of an unauthorized power supply voids all regulatory compliance certification and may cause damage to the supply and the end product.
- Unless otherwise stated, the AC/DC adapters are not suitable for use in air handling spaces or in wall cavities.
- The installation must always be in accordance with the applicable provisions of National Electrical Code ANSI/NFPA 70, article 75 and the Canadian Electrical Code part 1, section 16.
- The power supply must not be permanently fixed to building structure or similar structure.

② **Input connector** — Connect one end of the twisted pair cable from an MTP transmitter to this RJ-45 connector (s**ee "TP Cable Termination"** to wire the connector).

CAUTION: Do not connect these devices to a computer data or telecommunications network.

③ **Buffered output connector** — Connect up to 5 daisy-chained MTP receivers to this RJ-45 connector.

NOTE: In a daisy-chain, the maximum distance from video source to display device should not exceed 1500 feet.

④ **High resolution video output connector** — Connect a projector or other high resolution video device to this 15-pin HD connector for RGB output.

> **NOTE:** See DIP switch settings for signal format output.

⑤ **Audio connector** — Connect a suitable audio device to the 5-pole captive screw connector for mono audio output.

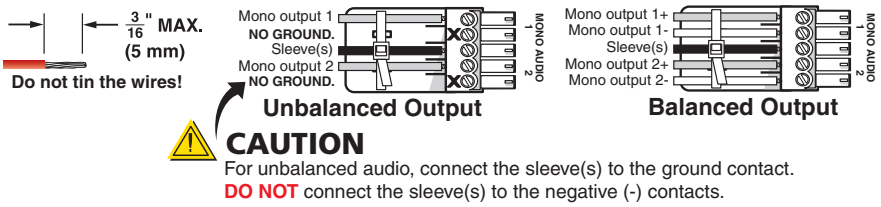
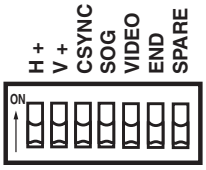


Figure 4. Audio Connector Wiring

⑥ **Receiver DIP switches** — Set these DIP switches for the applicable signal.

- H sync (H+) and V sync (V+) switches — Set these switches up for positive sync or down for negative sync.
- Composite sync (CSync), Sync on green (SOG), and Video switches — Set these switches as shown in the table below to output the indicated format.

Output Format	C Sync	SOG	Video
RGBHV	▼	▼	▼
RGBS	▲	▼	▼
RGsB	▼	▲	▼
Component video*	▼	▼	▲
S-video	▼	▼	▲
Composite video*	▼	▼	▲
* Input video format must match. ▼ = switch is down ▲ = switch is up			



- End unit switch — Set this switch up if either of the following is true:
  - The receiver being configured is the only receiver connected to the transmitter.
  - The receiver being configured is the last receiver in a daisy-chained system.

Power Supply Wiring

NOTE: This product is intended to be supplied by a UL Listed power supply and output rated at 12 VDC, 1 A.

Wire the supplied male power connector (plug) as in shown below.

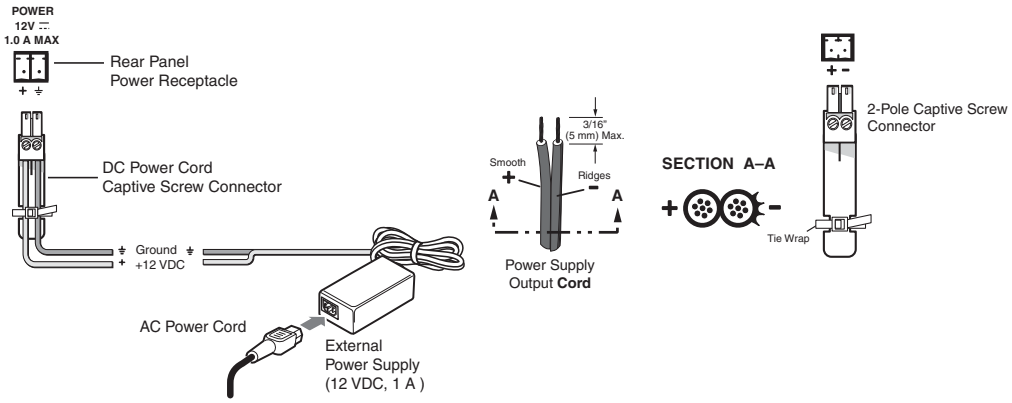


Figure 5. Power Connector Wiring

NOTES:
- The length of the exposed wires in the stripping process is critical. The ideal length is 3/16 inches (5 mm). If it is longer, the exposed wires may touch one another, causing a short circuit between them. Any shorter and the wires could be easily pulled out even if tightly fastened by the captive screws.
- Do not tin the wires. Tinned wire does not hold its shape and can become loose over time.

CAUTION: Power supply voltage polarity is critical. Incorrect voltage polarity can damage the power supply and the product. Identify the power cord negative lead by the ridges on the side of the cord.

To verify the polarity before connection, plug in the power supply with no load and check the output with a voltmeter.

WARNING: The two power cord wires must be kept separate while the power supply is plugged in. Remove power before wiring.

As an alternative, an Extron PS 124 Universal 12 VDC Power Supply, part #60-1022-01, can power multiple MTPs or other Extron 12 VDC devices using only one AC power connector..

TP Cable Termination

NOTE: RJ-45 termination must comply with TIA/EIA T568A or TIA/EIA T568B wiring standards for all connections.

The figure below details the recommended termination of TP cables with RJ-45 connectors in accordance with the TIA/EIA T568A or TIA/EIA T568B wiring standards. Either standard can be used with CAT 5 cable, but the same standard must be used on both ends of the cable.

Pin	T568A Wire Color	T568B Wire Color
1	White-green	White-orange
2	Green	Orange
3	White-orange	White-green
4	Blue	Blue
5	White-blue	White-blue
6	Orange	Green
7	White-brown	White-brown
8	Brown	Brown

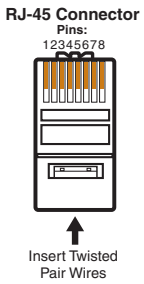


Figure 6. TP Cable Termination

NOTES:
- Enhanced Skew-free AV cable is not recommended for Ethernet/LAN applications.
- **DO NOT** connect the RJ-45 input to LAN, Ethernet, outside plant communications, or any telecommunications networks
- This cable is specially designed for compatibility with Extron Twisted Pair products that are wired using the TIA/EIA T568A standard.

The table below shows the MTP RJ-45 pin assignments for audio and video signals.

Pin	RGBHV	RGBS	Composite	S-Video	Component
1	Red/V sync +	Red +	No Signal	Chroma +	R-Y +
2	Red/V sync -	Red -	No Signal	Chroma -	R-Y -
3	Mono Audio+	Mono Audio +	Mono Audio +	Mono Audio +	Mono Audio +
4	Green +	Green +	Video +	Luma +	Y +
5	Green -	Green -	Video -	Luma -	Y -
6	Mono Audio -	Mono Audio -	Mono Audio -	Mono Audio -	Mono Audio -
7	Blue/H Sync +	Blue/C Sync +	No Signal	No Signal	B-Y +
8	Blue/H Sync -	Blue/C Sync -	No Signal	No Signal	B- Y -

Figure 7. MTP RJ-45 Pin Assignments

Operation

This section describes the operation details for the MTP 1500RL RS SEQ receiver. It covers:

- **Front Panel Controls and Indicators**
- **Peaking and Level Adjustment**
- **Skew Delay Compensation**

Front Panel Controls and Indicators

Front panel features on the MTP 1500RL 15HD A SEQ receiver are shown below.

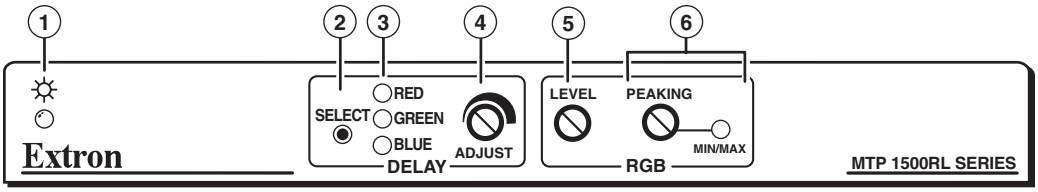


Figure 8. MTP 1500RL 15HD A SEQ Receiver Front Panel

① **Power LED** — Indicates power is applied to the MTP.

② **Select button** — This recessed button selects the red, green, or blue video signal to adjust, and resets all them to a skew delay of zero nanoseconds.

Press and release this button to cycle through and select the red, green, or blue video signal for adjusting. The selected signal is indicated by the Red, Green, and Blue LEDs (③).

Press and hold the button in for approximately 3 seconds to zero the skew delay for red, green, and blue. The Red, Green, and Blue LEDs (④) all turn off. Release the button.

> **NOTE:** The SEQ receiver automatically saves the setting for the video signal that is being deselected when this button is pushed or when the selection times out after 10 seconds.

③ **Red, Green, and Blue LEDs** — These LEDs indicate the video signal that is selected by the Select button (②) for skew adjustment using the Adjust control (④). The LED for the selected color blinks when the skew compensation for the video signal of the selected color has reached the minimum or maximum limit.

④ **Adjust skew control** — This control delays the selected red, green, or blue video signal up to a maximum of 62 nanoseconds (ns), made in 2 ns incremental steps. Rotate the control counterclockwise to reduce the delay or clockwise to increase it (see "**Skew Delay Compensation**" for details).

NOTES:
- The movement of the adjustment control is smooth and does not have mechanical steps or high- and low-limit stops.
- Watch the displayed image to observe the steps of delay.
- For best performance set the skew of the most delayed signal to 0 ns (minimum) and adjust the other two signals to meet it.

⑤ **Level control** — The Level control alters the video output voltage to affect the brightness of the displayed image.
Adjust the knob while viewing the displayed image to set the level or boost that provides the best picture quality (see "**Peaking and Level Adjustment**" section for details).

⑥ **Peaking control** — Peaking affects the sharpness of a picture. Increased peaking can compensate for mid- and high-frequency detail loss due to low bandwidth system components or capacitance in long cables.

Adjust this control while viewing the displayed image to obtain the optimum picture sharpness. The LED lights red when the peaking is at the minimum (0) and maximum (100%) peaking settings (see the "**Peaking and Level Adjustment**" section for details).

NOTE: To avoid possible video loss due to errors in the format detection, always start with minimal peaking and level, then increase values only as required.

Peaking and Level Adjustment

For best performance and video format detection, the equalization of the MTP should be adjusted properly. To achieve this, do the following:

1. Terminate the green video signal output with a 75 ohm resistance, and measure the video signal.

NOTE:
- Set the gain adjustment so that a white field video signal is +0.7 volts from the ground level.
- Set the peaking adjustment using the highest frequency video format signal for the system in RGB, component video, or S-video.

2. Using an alternating black and white pattern, adjust the peaking so that the video signal matches that of the white field video. This equalizes both the low frequency (white field) and the high frequency (alternating black and white field) to the same video level for best results.

   Do not over-peak the signal.

Skew Delay Compensation

CAT 5, 5e and CAT 6 cable can lead to registration errors between the red, green, and blue video signals. Pair skew can be measured with test equipment or identified by viewing a crosshatch test pattern to determine if either the red, green, or blue video image leads (appears to the left of) the other two video images.

> **NOTE:** Unless the TP cable is changed, the skew adjustment should need to be made only once, during installation

SEQ receiver skew compensation

The SEQ receivers have built-in skew compensation capabilities. Adjust the equalization as follows:

1. Set the skew delay to zero for red, green, and blue as follows:
   a. Use a Tweeker or other small screwdriver to press and hold the Select button for 3 seconds. The Red, Green, and Blue LEDS all go out.
   b. Release the Select button.
2. Use UTP cable test equipment or examine the displayed video image with a critical eye to determine which video signal (red, green, or blue) is shifted furthest to the right.

   > **NOTE:** A crosshatch test pattern or a black background with vertical white lines is ideal for determining skew.

3. Adjust the furthest left video signal as follows:

   > **NOTE:** The SEQ receiver cannot shift the furthest right video image to the left.

   a. Use a Tweeker or other small screwdriver to press and release the Select button until the LED for the left-shifted color (red, green, or blue) lights.
   b. Slowly rotate the Adjust control clockwise while monitoring the display. Continue to rotate the control until that color is properly converged.

   > **NOTE:** A 2ns adjustment is very fine. Up to 10ns of delay may be necessary before a change in the display is detectable. The maximum delay possible is 62ns.

   c. Use a Tweeker or other small screwdriver to press the Select button one more time to save the most recent adjustment or allow the 10-second timeout to elapse.
4. If the remaining color is left shifted, repeat step **3**.

Reference Information

This section provides information about:

- **Specifications**
- **Part Numbers and Accessories**

Specifications

Video

Gain	Unity
Number/signal type	1 set of proprietary analog signals
Connectors	1 female RJ-45

Video input — see MTP Series transmitters specifications

Video output — receiver

Number/signal type	1 set of proprietary analog signals 1 analog RGBHV, RGBS, RGsB, RsGsBs, component video (bi- or tri-level sync), S-video, or composite video
Connectors	1 female RJ-45 1 female 15-pin HD
Nominal level	1 V p-p for Y of component video and S-video, and for composite video 0.7 V p-p for RGB and for R-Y and B-Y of component video 0.3 V p-p for C of S-video
Minimum/maximum levels	0.3 V to 1.45 V p-p
Impedance	75 ohms
Return loss	<-30 dB @ 5 MHz
DC offset	<±35 mV with input at 0 offset
Skew compensation	62 ns
Maximum resolution	Up to 1600x1200 and 1080p at 1500'; 1920x1200 and 2048x1080 at 1200'

Sync

Output type	RGBHV, RGBS, RGsB, RsGsBs
Standards	NTSC 3.58, NTSC 4.43, PAL, SECAM
Output level	0.3 Vp-p for component video (bi-level sync) 0.6 Vp-p for component video (tri-level sync) TTL: 4.0 V to 5.0 V p-p, unterminated for RGBHV, RGBS
Output impedance	110 ohms
Polarity	Positive or negative (switch-selectable)

Audio

Number/signal type	1 set of proprietary analog signals
Connectors	1 female RJ-45
Gain	Unbalanced output: 0 dB; balanced output: +6 dB
Frequency response	20 Hz to 20 kHz, ±1 dB
THD + Noise	0.15% @ 1 kHz, 0.3% @ 20 kHz at nominal level
S/N	>70 dB at maximum output (unweighted)
Stereo channel separation	>60 dB @ 1 kHz
CMRR	>43 dB @ 20 Hz to 20 kHz

Audio input — See MTP Series transmitters specifications

NOTE: 0 dBu = 0.775 Vrms, 0 dBV = 1 Vrms, 0 dBV ≈ 2 dBu

Audio output

Number/signal type	2 mono, balanced/unbalanced
Connectors	(1) 3.5 mm captive screw connector, 5 pole
Impedance	50 ohms unbalanced, 100 ohms balanced
Gain error	±1 dB channel to channel
Nominal level	+4 dBu (1.23 Vrms), -10 dBV (316 mVrms)
Maximum level	+18 dBu, unbalanced at 1% THD+N

General

Recommended cable type	CAT 5/5e/6 (shielded or unshielded)
Power supply	External Input: 100-240 VAC, 50-60 Hz Output: 12 VDC, 1 A, 12 watts
Power input requirements	12 VDC, 1.0 A max.
Temperature/humidity	Storage: -40 to +158 °F (-40 to +70 °C) / 10% to 90%, noncondensing Operating: +32 to +122 °F (0 to +50 °C) / 10% to 90%, noncondensing
Cooling	Convection, vents sides to top
Mounting	
Rack mount	Yes, with optional 1U rack shelf
Wall mount	Yes, with optional wall mounting kit
Enclosure type	Metal
Enclosure dimensions	1.0" H x 8.75" W x 6.0" D (half rack wide) (2.5 cm H x 22.2 cm W x 15.2 cm D) (Depth excludes connectors.)
Product weight	1 lb (0.5 kg)
Shipping weight	2 lbs (1 kg)
Vibration	ISTA 1A in carton (International Safe Transit Association)
Regulatory compliance	
Safety	CE, c-UL, UL
EMI/EMC	CE, C-tick, FCC Class A, ICES, VCCI
MTBF	30,000 hours
Warranty	3 years parts and labor

NOTE: All nominal levels are at ±10%.

NOTE: Specifications are subject to change without notice.

Part Numbers and Accessories

Included Parts

Description	Part Number
MTP 1500RL 15HD A SEQ receiver	60-959-02
External, 12 VDC, 1A power supply PS 1210 C	70-775-01
3.5 mm, 3-pole captive screw connector for RS 232 connections	
IEC power cord (1)	
MTP 1500RL 15HD A SEQ Setup Guide	

Optional Parts

These items can be ordered separately:

Description	Part Number
Accessories	
PS 124 multiple output 12 V power supply	60-1022-01
19" 1U Universal Rack Shelf	60-190-01
19" 1U Basic Rack Shelf	60-604-01
Enhanced Skew-Free™ AV cable	
NOTE: Enhanced Skew-Free AV UTP cables are not recommended for Ethernet LAN applications.	
Enhanced Skew-Free AV cable (cut, various lengths)	26-569-xx
Enhanced Skew-Free AV 1000' (Bulk) (non-plenum)	22-141-03
Plenum enhanced Skew-Free AV 1000' (Bulk)	22-142-03
RJ-45 connectors	
CAT 6 jack (black)	10-463-10
CAT 6 jack (red)	10-463-11
CAT 6 jack (blue)	10-463-12
CAT 6 jack (orange)	10-463-13
CAT 6 jack (gray)	10-463-14
CAT 6 jack (white)	10-463-15
CAT 6 jack (ivory)	10-463-16

Mounting

This section outlines the various mounting options available for the MTP 1500RL unit:

- **Tabletop Placement**
- **Rack Mounting**
- **Under-desk Mounting**
- **Through-desk Mounting**

Tabletop Placement

Attach the four provided rubber feet to the bottom of the unit and place it in any convenient location.

Rack Mounting

UL Guidelines for Rack Mounting

The following Underwriters Laboratories (UL) guidelines are relevant to the safe installation of these products in a rack:

1. **Elevated operating ambient temperature** — If the unit is installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient temperature. Therefore, install the equipment in an environment compatible with the maximum ambient temperature (Tma: +122 °F, +50 °C) specified by Extron.
2. **Reduced air flow** — Install the equipment in the rack so that the equipment gets adequate air flow for safe operation.
3. **Mechanical loading** — Mount the equipment in the rack so that uneven mechanical loading does not create a hazardous condition.
4. **Circuit overloading** — Connect the equipment to the supply circuit and consider the effect that circuit overloading might have on overcurrent protection and supply wiring. Appropriate consideration of the equipment nameplate ratings should be used when addressing this concern.
5. **Reliable earthing (grounding)** — Maintain reliable grounding of rack-mounted equipment. Pay particular attention to supply connections other than direct connections to the branch circuit (such as the use of power strips).

Rack Mounting Procedure

The unit can be mounted on optional rack systems, including:

- RSU 129: 9.5 inch deep, 1U rack shelf kit (part number **60-190-01**)
- RSU 126: 6 inch deep, 1U rack shelf kit (part number **60-190-10**)

To mount the device on a rack shelf

1. Remove the feet from the bottom of the MTP, if they are installed.
2. Mount the MTP using two 4-40 x 3/16 inch screws in opposite (diagonal) corners to secure the MTP to the shelf.

   NOTE: **DO NOT** stack units on top of one another as this may cause the units to overheat.

3. Install false faceplates or other units to the rack shelf.

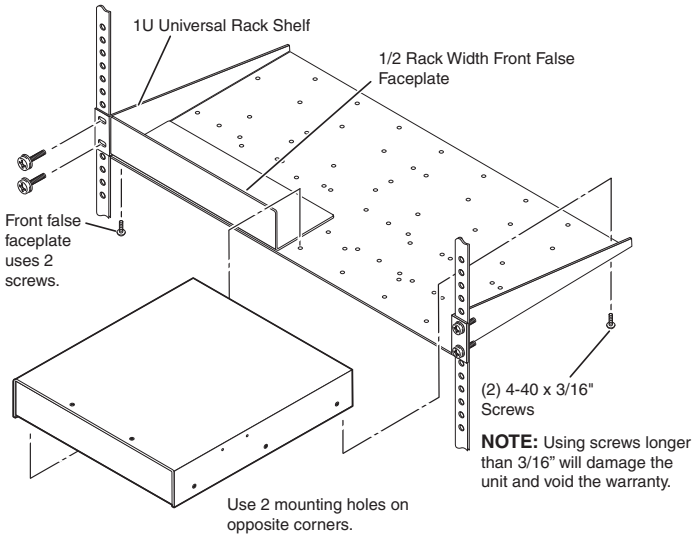

1U Universal Rack Shelf
1/2 Rack Width Front False Faceplate
Front false faceplate uses 2 screws.
(2) 4-40 x 3/16" Screws
NOTE: Using screws longer than 3/16" will damage the unit and void the warranty.
Use 2 mounting holes on opposite corners.

Figure 9. Mounting the MTP on a Standard Shelf

Under-desk Mounting

Mount the unit under a desk or podium, using the optional Extron MBU 125 under-desk mounting kit (part number **70-077-01**) by following the instructions provided with the kit.

Through-desk Mounting

Mount the unit through a desk or podium using the optional Extron MBD 129 through desk mounting kit (part number **70-077-02**) by following the instructions provided with the kit.

Extron Warranty

Extron Electronics warrants this product against defects in materials and workmanship for a period of three years from the date of purchase. In the event of malfunction during the warranty period attributable directly to faulty workmanship and/or materials, Extron Electronics will, at its option, repair or replace said products or components, to whatever extent it shall deem necessary to restore said product to proper operating condition, provided that it is returned within the warranty period, with proof of purchase and description of malfunction to:

USA, Canada, South America, and Central America:
Extron Electronics
1001 East Ball Road
Anaheim, CA 92805
U.S.A.

Japan:
Extron Electronics, Japan
Kyodo Building, 16 Ichibancho
Chiyoda-ku, Tokyo 102-0082
Japan

Europe, Africa, and the Middle East:
Extron Europe
Hanzeboulevard 10
3825 PH Amersfoort
The Netherlands

China:
Extron China
686 Ronghua Road
Songjiang District
Shanghai 201611
China

Asia:
Extron Asia
135 Joo Seng Road, #04-01
PM Industrial Bldg.
Singapore 368363
Singapore

Middle East:
Extron Middle East
Dubai Airport Free Zone
F12, PO Box 293666
United Arab Emirates, Dubai

This Limited Warranty does not apply if the fault has been caused by misuse, improper handling care, electrical or mechanical abuse, abnormal operating conditions, or if modifications were made to the product that were not authorized by Extron.

NOTE: If a product is defective, please call Extron and ask for an Application Engineer to receive an RA (Return Authorization) number. This will begin the repair process.

USA: (714) 491-1500 **Europe**: 31.33.453.4040
Asia: 65.6383.4400 **Japan**: 81.3.3511.7655

Units must be returned insured, with shipping charges prepaid. If not insured, you assume the risk of loss or damage during shipment. Returned units must include the serial number and a description of the problem, as well as the name of the person to contact in case there are any questions.

Extron Electronics makes no further warranties either expressed or implied with respect to the product and its quality, performance, merchantability, or fitness for any particular use. In no event will Extron Electronics be liable for direct, indirect, or consequential damages resulting from any defect in this product even if Extron Electronics has been advised of such damage.

Please note that laws vary from state to state and country to country, and that some provisions of this warranty may not apply to you.

Extron **USA - West** Headquarters	Extron **USA - East**	Extron **Europe**	Extron **Asia**	Extron **Japan**	Extron **China**	Extron **Middle East**	Extron **Korea**	Extron **India**
+800.633.9876 Inside USA/Canada Only **+1.714.491.1500** FAX: **+1.714.491.1517**	**+800.633.9876** Inside USA/Canada Only **+1.919.863.1794** FAX: **+1.919.863.1797**	**+800.3987.6673** Inside Europe Only **+31.33.453.4040** FAX: **+31.33.453.4050**	**+800.7339.8766** Inside Asia Only **+65.6383.4400** FAX: **+65.6383.4664**	**+81.3.3511.7655** FAX: **+81.3.3511.7656**	**+4000.EXTRON** **+4000.398766** Inside China Only **+86.21.3760.1568** FAX: **+86.21.3760.1566**	**+971.4.2991800** FAX: **+971.4.2991880**	**+82.2.3444.1571** Fax: **+82.2.3444.1575**	**1800.3070.3777** Inside India Only **+91-80-3055.3777** Fax: **+91 80 3055 3737**

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